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The Monthly Evening Sky Map

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A SCIENTIFIC JOURNAL AND EDUCATIONAL GUIDE IN ASTRONOMY FOR THE AMATEUR
Founded in 1905 by Leon Barritt

ALSO A STAR, CONSTELLATION AND PLANET FINDER MAP ARRANGED FOR THE CURRENT MONTHS - MORNING AND EVENING - AND PRACTICAL ANYWHERE IN THE WORLD
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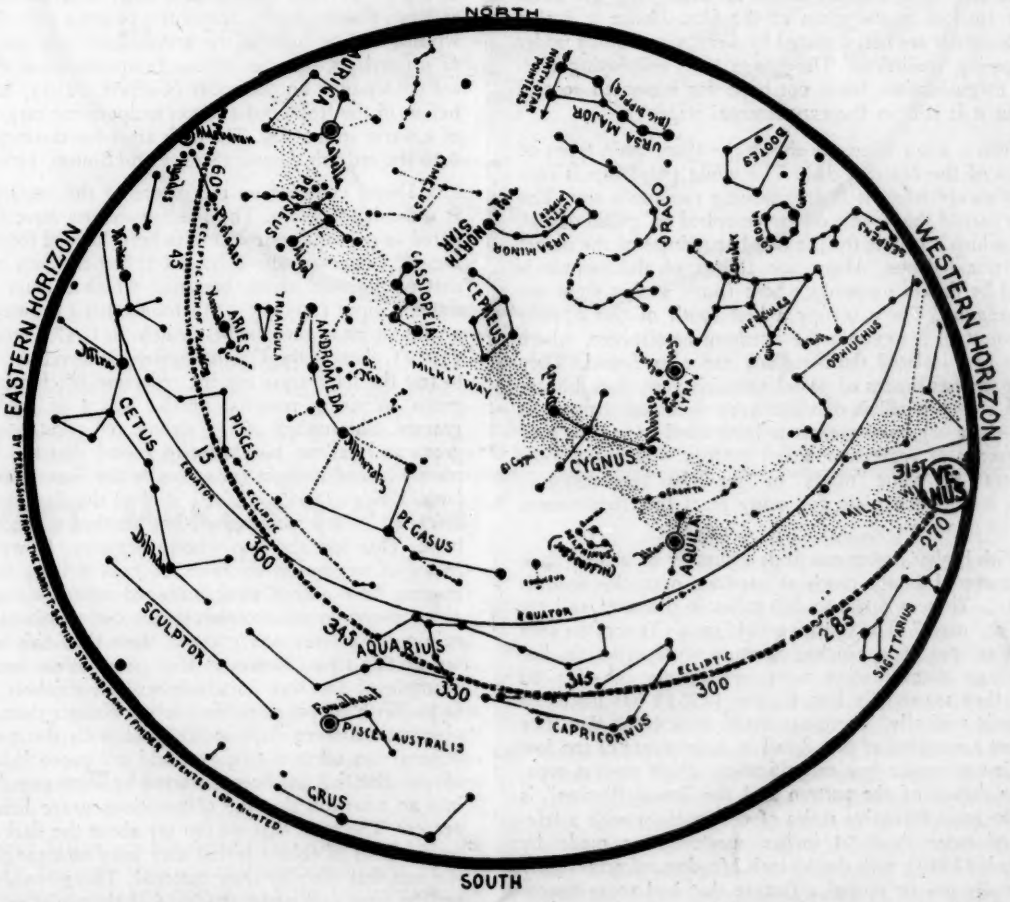
EVENING SKY MAP FOR OCTOBER



AT 9:00 P.M., OCT. 1 **8:00 P.M., OCT. 15** **7:00 P.M., OCT: 31**

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is

XUM

A NEW THEORY OF THE SURFACE OF MARS

By Dean B. McLaughlin

Of all the heavenly bodies, Mars probably ranks third in terms of the total man-hours spent by astronomers (both amateur and professional) in studying it. The moon and sun alone claim greater attention. Only three planetary bodies have their solid surfaces open to our detailed inspection: the earth, the moon, and Mars. All three have features that are distinctively their own. Mercury and the large satellites of Jupiter have visible markings, but they are very difficult to observe.

When it is closest, as it was in September 1956, Mars is 35 million miles from the earth. Its diameter, 4,200 miles, only slightly exceeds half that of the earth. In a powerful telescope it appears about as large as an orange held at arm's length. Even the 200-inch telescope, under perfect seeing conditions could not resolve two spots less than four miles apart. Observation of fine details is handicapped by the earth's atmosphere and by limitations of our recording devices. Turbulence in our air causes the image to jump and squirm during a photographic exposure. To catch a tiny fraction of a second of steady seeing, we have to concentrate the light into an image so small that the finest details are lost in the grain of the film. Hence it is that delicate details are best detected by direct visual study under good seeing conditions. The image tube, employing electronic magnification, holds out hope for improved recording, but it is still in the experimental stage.

Even a small telescope shows the three main types of features of the Martian disk. The white polar cap is conspicous except when it is approaching minimum size. The greater part of the surface can be described as "pastel orange pink", which accounts for the familiar redness of the planet to the unaided eye. About one fourth of the surface is covered by darker markings whose forms at first sight appear irregular. These occupy a belt south of the equator and project in places into the northern hemisphere, where one or two isolated dark regions are also found. They present various shades of pastel greenish gray, dark bluish, and even deep purplish or violet gray. Seasonal changes of tint in these regions have often been cited as evidence of the presence of vegetation. From analogy with the moon's dark areas, the name "maria" or "seas" has been adopted, though it has been plain for many years that they cannot be bodies of water.

With higher power one finds a number of smaller dark spots scattered pretty much at random over the reddish "deserts". These are 100 to 200 miles in diameter and are known as "oases". The controversial "canals" are often seen with telescopes of six inches aperture ande upwards, but under high magnification with instruments of over 30 inches, they are usually lost. Kuiper (1955) has discussed the canals critically. There are many indications that they represent a merging of fine detail in instruments of too low resolution or under low magnification. High powers separate the details of the pattern and the "canal illusion" is lost. The most extensive series of observations with a telescope of more than 30 inches aperture was made by Antoniadi (1930) with the 33-inch Meudon refractor. Only occasionally did he record a feature that had some resemblance to the ideal "canal". Instead, he saw many of the canals resolved into natural-looking detail. The same result has been obtained by Dollfus (1953) at Pic du Midi. However, this verdict has not received unanimous acceptance.

Mars' atmosphere, area for area, is about one fifth that of the earth. The most dependable measurement of its amount depends upon the polarization of light by atmospheric scattering (Dollfus, 1951). The Martian atmosphere seems peculiarly efficient in scattering violet light, so that we seldom see the surface in photographs taken in the short wave-lengths. The composition of the atmosphere is not directly determinable. There is several times as much carbon dioxide per unit as on the earth (Kuiper, 1949, p. 335; Grandjean and Goody, 1955), but it is still a minor constituent. Water vapour, according to spectroscopic test, is less than 0.2 per cent. of ours, and oxygen is equally scarce (Dunham, 1949). The bulk of the atmosphere is some gas that has no absorption lines in accessible parts of the spectrom. Nitrogen, the main constituent of our air, satisfies this condition and also the requirement of cosmic abundance. Probably argon is present also, since it is a decay product of radioactive potassium. If the production of argon has been the same, area for area, on Mars as on earth, then Mars' atmosphere should be about 5 per cent. argon. The remaining 95 per cent. is probably nitrogen.

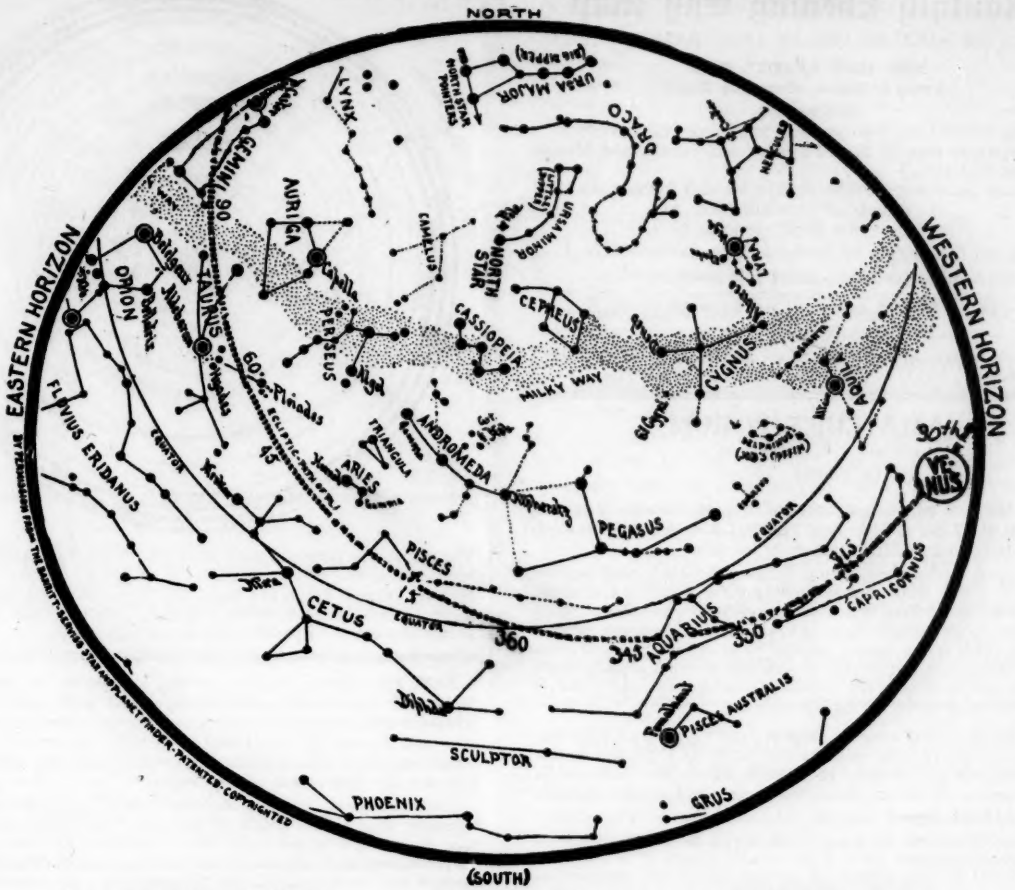
Mars is extremely dry. The polar caps are water (Kuiper, 1949, p. 337), but they are probably only inches in thickness. Dust storms have been seen moving slowly, as large yellow clouds, across the planet's face. Occasional whitish clouds, high in the atmosphere, may be composed of ice crystals, like our cirrus. Temperatures at the surface are colder than on the earth (Gifford, 1956), but at perihelion in the tropics, the moon temperature may equal that of a warm spring day. The dark areas are distinctly warmer than the reddish deserts (Strong and Sinton, 1956).

Direct evidence on the nature of the surface material is difficult to obtain. The reddish deserts have been compared to red sandstone and have been likened to the Painted Desert. However, the infra-red reflection does not match that of the iron oxide, hematite, which colours red sandstone. Kuiper (1949, p. 335) found that a brownish felsite, a volcanic rock, gave the best match. In 1937, Peter Millman (1939), then at the David Dunlap Observatory, attempted to test the dark areas for the reflection of chlorophyll, the green colouring material of the leaves of trees and of grasses. Chlorophyll has a strong reflection band in the green and yellow, but Millman found that this was completely absent in light reflection by the "seas". Some years later, Kuiper (1949, p. 339) studied the dark areas in the infra-red, where chlorophyll has another strong reflection band. This test also was wholly negative. However, some forms of vegetation on earth, such as lichens and certain mosses, have only a weak infra-red reflection, so that the observations do not completely rule out all plants. They do rule out our trees and grasses. More than this we cannot say at this time. However, this observation furnishes an example of the way in which wishful thinkers can twist facts. With proper scientific caution Kuiper stated that the observations were "not inconsistent with the presence of lichens". In other words, he could not prove lichens to be *absent*. But this has been distorted by some popular writers into an assertion that the observations prove lichens to be *present*. The most that we can say about the dark markings on the basis of colour is that they have no strongly marked features that identify their material. The greenish tints are for the most part pastel shades, and the violet or purple of the darkest parts is probably due to scattering of light by the Martian atmosphere through which we have to view them.

There is another possible mode of study of Mars that has been neglected. This can be called the morphological approach. The shapes of areas of contrasting colour on the

—Continued on Page 8

EVENING SKY MAP FOR NOVEMBER



AT 9:00 P.M., NOV. 1 8:00 P.M., NOV. 15 7:00 P.M., NOV: 30

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper. This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitudes in Europe.

COMET MRKOS (1957d)

BY IRVING L. MEYER

The brightest and most interesting comet of our generation was discovered and reported, via Copenhagen, by that prolific Czech comet-discoverer, A. Mrkos, on August 2nd. Credit for the discovery and reporting goes to Mr. Mrkos, though, oddly enough, the comet was so bright that the first person to note it, in all probability, was an airline pilot in this country, who saw the new object some 5° east of Castor (in Gemini) on both July 31 and August 1 but who was prevented by clouds from confirming the discovery until August 4th.

Comet Mrkos was not seen by the writer until the 16th of August, but even then it was a wonderful sight. Magnitude was about the 2nd or 3rd, and the tail, even to the naked eye, was several degrees in length. At that time it was not far south of the bowl of the Big Dipper. The following night, the writer had the use of 7 x 50 coated binoculars, and the comet became a truly wonderful sight with a tail fully 4° in length. Through the following weeks the comet has grown fainter, though still visible to the naked eye, following a course which has taken it to the south of Arcturus, and which, ultimately, will carry it through Virgo and Libra.

The best orbital elements available to the writer, those computed by M. P. Candy, are based on three *normal* positions derived from 19 separate observations of the comet, covering a span of eight days in August. *Normal* positions are, generally speaking, an averaged position obtained by comparing direct observations with the best available theoretical positions, and tend to remove the observational errors inherent in measuring an accurate position of so large and ill-defined an object as a comet. This orbit was computed on the assumption that the orbit of the comet was parabolic; differences in the computation which could not be eliminated, indicate that the orbit is either an ellipse or, conceivably, an hyperbola. Both parabolic and hyperbolic motion means that the comet is not a member of our solar system, and that it will never be seen again. However, almost all cometary orbits are so elongated that, considering the short observational period, it is difficult to determine whether the orbit is that of an ellipse or a parabola. Nevertheless, the elements placed the time of perihelion passage as August 1, at distance of 33.0 million miles from the Sun. The comet is now receding rapidly from both the earth and the Sun. For instance, the distance from the earth on August 24th was 108 million miles; on October 18th, it will be

—*Continued on Page 7*

XUM

The
Monthly Evening Sky Map
FOUNDED IN 1905 BY LEON BARRITT

MRS. LEON BARRITT, Editor
Irving L. Meyer, Managing Editor

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AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.
OCTOBER, 1957

THE SUN: is plunging southward, moving through Virgo all month, to the Libra border. It is 93,800,000 miles from the earth the 1st, decreasing to 92,200,000 miles the 31st.

There is a total eclipse of the Sun on the 23rd, with totality confined to a very small area just touching the Antarctic Continent. As a partial, this eclipse is visible over most of the Antarctic Continent, the extreme south Pacific Ocean, and the southern portion of Africa. This is the second unusual solar eclipse this year—unusual in that the axis of the Moon's shadow does not actually touch the earth. At its closest, the axis of the shadow is approximately twenty-one miles above the earth's surface.

THE MOON: is at *apogee* (farthest from the earth) on the 5th, at a distance of 252,000 miles, and is at *perigee* (closest to the earth) the 21st at a distance of 224,000 miles. This variation in distance makes the Moon about ⅛th larger in apparent diameter at perigee than at apogee.

Libration: Maximum exposure of the region on the Moon's limbs takes place as follows:

October	3	South limb, 6.7°
October	15	East limb, 6.4°
October	18	North limb, 6.8°
October	27	West limb, 6.8°
October	31	South limb, 6.9°

The Moon's phases (E.S.T.):

Full Moon	October 8 at 4:42 pm
Last Quarter	16 at 8:44 am
New Moon	22 at 11:43 pm
First Quarter	30 at 5:48 am

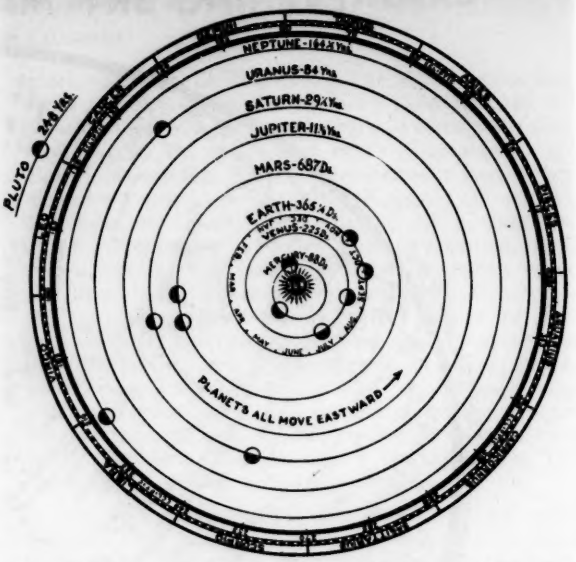
MERCURY: races through almost the entire length of Virgo, into Libra. It is in the morning sky until conjunction (superior) with the Sun on the 23rd, whereupon it enters the evening sky. Too close to the Sun the entire month to be observable. It is farthest from the earth the 31st at 134 million miles.

VENUS: is the brilliant gem of the early evening sky. It moves from Libra, through Scorpio, into Ophiuchus. On the 17th it is about 2° north of the first-magnitude star, Antares. Venus is coming closer to the earth (95 million miles the 1st, decreasing to 75 million miles the 31st) and is increasing greatly in apparent diameter increases from 16" to 21", the amount of the surface illuminated (as seen from the earth) decreases from 70% to 58%. The planet will look gibbous in the telescope—like the Moon shortly after first quarter. Brightness doesn't change much, and averages magnitude -3.7. Venus sets shortly after total darkness sets in.

MARS: is in the morning sky in Virgo the entire month. It is too close to the Sun to be observable. Distance the first is 246 million miles, and the thirty-first is 239 million miles. Apparent angular diameter averages 3.6".

JUPITER: is another member of the Virgo family, in the evening sky until conjunction with the Sun on the 5th, whereupon it enters the morning sky. It is too close to the Sun the entire month to be observable. Greatest distance from the earth, the 5th is 600 million miles.

HELIOCENTRIC POSITIONS OF THE PLANETS, OCTOBER



The planets are shown in their respective orbits. Two positions, one for the first, and one for the last day of the month are given for Mercury, Venus, Earth, and Mars. The arrow indicates the last day of the month. Jupiter, Saturn, Uranus, Neptune, and Pluto are shown in their mean position for the current month.

SATURN: remains in the evening sky, north of Antares, in Scorpio. It sets shortly after the Sun, and will soon disappear from the evening scene. It is in conjunction with Venus on the 20th and, though the two planets will be 4° apart, will make an interesting sight. Saturn is no longer well placed for observation. Distance the 15th is 990 million miles.

URANUS: is a "morning star" in Cancer, rising not long after midnight. It is at best a difficult naked-eye object, since its magnitude of 6 puts it at the borderline of visibility. Of course, it is a simple object with any optical aid, and a magnification of 50 diameters will show its small disc. Distance the 15th is 1748 million miles.

NEPTUNE: is also in Libra, but too close to the Sun to be observable. It is in conjunction with the Sun on the 25th, and then enters the morning sky. Maximum distance, the 25th, is 2910 million miles.

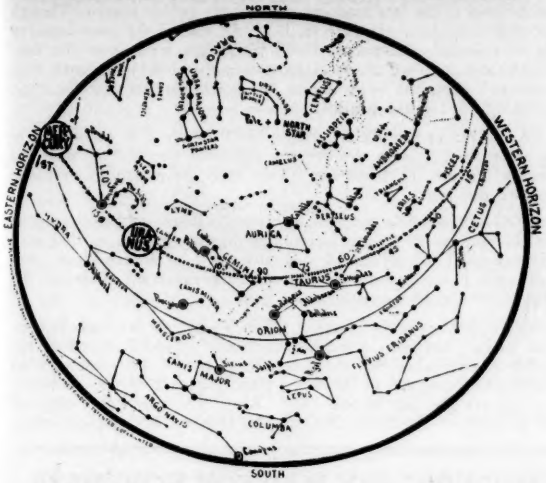
ASTRONOMICAL CALENDAR

Eastern Standard Time
OCTOBER, 1957

Oct. 1—	4:15 pm	Minimum of Algol
4—	1:04 pm	Minimum of Algol
5—11:—	am	Conjunction, Jupiter and Sun
6—	5:— am	Mercury greatest heliocentric latitude north
7—	9:52 am	Minimum of Algol
9—10:—	pm	Venus in aphelion
10—	6:41 am	Minimum of Algol
13—	3:30 am	Minimum of Algol
13—	6:— am	Conjunction, Mercury and Mars; Mercury north 0° 57'
14—	5:— am	Conjunction, Mercury and Jupiter; Mercury north 0° 30'
16—12:19	am	Minimum of Algol
16—	1:— pm	Conjunction, Mars and Jupiter; Mars south 0° 24'
17—	7:01 pm	Conjunction, Uranus and Moon; Uranus north 6° 7'
18—	9:07 pm	Minimum of Algol
20—	7:— am	Conjunction, Venus and Saturn; Venus south 4° 7'
21—	5:56 pm	Minimum of Algol
22—	3:33 am	Conjunction, Jupiter and Moon; Jupiter north 3° 29'
22—	7:33 am	Conjunction, Mars and Moon; Mars north 2° 48'
22—11:46	pm	Conjunction, Mercury and Moon; Mercury north 1° 52'

XUM

MORNING SKY MAP FOR OCTOBER



At 5:00 A.M., OCT. 1; 4:00 A.M., OCT. 15; 3:00 A.M., OCT: 31

23—	Total eclipse of the Sun
23—12:— am	Jupiter in aphelion
23— 5:36 am	Conjunction, Neptune and Moon; Neptune north 2° 32'
23—10:— pm	Superior conjunction, Mercury and Sun; Mercury north 0° 38'
24— 2:45 pm	Minimum of Algol
25— 8:— am	Conjunction, Mercury and Neptune; Mercury south 1° 17'
25— 8:— pm	Conjunction, Neptune and Sun
25—10:47 pm	Conjunction, Saturn and Moon; Saturn south 1° 20'
26—10:17 am	Conjunction, Venus and Moon; Venus south 6° 10'
27—11:34 am	Minimum of Algol
29— 3:— pm	Mercury in descending node
30— 8:22 am	Minimum of Algol

AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

NOVEMBER, 1957

THE SUN: travels southward from the Virgo-Libra boundary, through Libra, into Scorpio. Distance from the earth decreases from 92.2 million miles the 1st to 91.6 million miles the 30th.

THE MOON: is farthest from the earth *(apogee)* twice this month—on the 2nd at 252,000 miles and the 30th at 251,000 miles; and is closest *(perigee)* the 18th at 228,000 miles.

Libration: Maximum exposure of the region on the Moon's limbs takes place as follows:

November 11 East limb, 5.2°
November 14 North limb, 6.8°
November 24 West limb, 5.7°
November 27 South limb, 6.8°

The Moon's phases (E.S.T.):

Full Moon	November 7 at 9:32 am
Last Quarter	14 at 4:59 pm
New Moon	21 at 11:19 am
First Quarter	29 at 1:57 am

There is a total eclipse of the Moon on the 7th, not visible from the eastern part of North America. Approximately half the eclipse is visible from the western part of the United States and Canada; the entire eclipse is visible over most of the Pacific Ocean Area, Alaska, Siberia and Western Asia.

Circumstances of the eclipse (E.S.T.):

Moon enters penumbra	November 7 at 6:30 am
Moon enters Umbra	7 at 7:43 am
Total eclipse begins	7 at 9:12 am
Middle of eclipse	7 at 9:27 am
Total eclipse ends	7 at 9:42 am
Moon leaves umbra	7 at 11:11 am
Moon leaves penumbra	7 at 12:23 pm

The magnitude of the total eclipse is 103.5% of the Moon's diameter.

MERCURY: speeds from Libra, through Scorpio and Ophiuchus, into Sagittarius. It is in the evening sky all month, but too close to the Sun to be observable, though it might be possible to see this elusive planet toward the close of the month, very low in the west, in the twilight band, as the sky darkens. It is in conjunction with Saturn on the 21st (3½° south). In the telescope Mercury would appear gibbous all month, and averaging magnitude -0.4. Distance the 1st is 134 million miles, and apparent diameter 4.6"; on the 30th, distance is 109 million miles, and apparent diameter 5.7".

VENUS: is the undisputed queen of the evening sky. A brilliant gem in the west, magnitude averages -4.0, many times brighter than any other star or planet. On the 18th it reaches greatest elongation from the Sun, 47° 14' east, putting it in wonderful observing position from either hemisphere. Telescopically, it changes this month from gibbous to crescent shaped, requiring only a small telescope to reveal these phases. Angular diameter increases from 21" the 1st (distance 74 million miles) to 29" (distance 54 million miles) the 30th. It moves from the Ophiuchus-Sagittarius boundary to a point in the latter constellation close to the Capricornus boundary.

MARS: in the morning sky, but too close to the Sun to be readily observable. It is practically on the far side of the Sun from the earth, and, accordingly, is very remote (239 million miles the 1st, 228 million miles the 30th) and relatively faint (magnitude 2). It moves from Virgo into Libra during the month.

JUPITER: is just north of Spica, in Virgo, and, though very close to the Sun, can be seen in the late morning or twilight sky, particularly toward the close of the month. Not well placed for observation. Distance the middle of the month is 583 million miles.

SATURN: in Ophiuchus, far south of the equator, remains in the evening sky, but is too close to the Sun to be observable. It is 1018 million miles from the earth on the 15th.

URANUS: rises around midnight from a point in Cancer. Just visible to the naked eye, it is, technically, a morning star and daily becomes better placed for observation. Distance the 15th is 1699 million miles.

NEPTUNE: is in the morning sky, in Virgo, too close to the Sun to be observable. This planet cannot be seen with the naked eye as it is magnitude 8, or about the same brightness at Titan, the principal Saturnian satellite. Distance the 15th is an immense 31.3 astronomical units or 2904 million miles.

SATELLITES OF JUPITER

OCTOBER

Day	West							East		
21			·3	·1	○	·2			·4	
22				1	○·	·3	2·		4·	
23			2·		○		·3	4·		·1●
24				2 1·	○		3·	4·		
25					○	3·	·1	2 4·		
26			3·	1·	2 4	○·				
27		3·		2 4·	○	1·				
28		4·	·3	·1	○	·2				
29		4·			○	3 1·	2·			
30	4·		2·		○		·3			·1●
31	·4			·2	1·○		3·			

Appearance of Jupiter and its satellites at 7:00 A.M., E.S.T. as seen in an inverting telescope

Jupiter is represented by the disc in the center of the chart. and each satellite by a dot and its appropriate number. The direction of the staellite's motion is from the dot toward the numeral. The numeral and light disc at the left margin of the chart indicates a satellite in transit across Jupiter's disc; the numeral and dark disc at the right margin indicates a satellite which is invisible because it is being eclipsed or occulted by Jupiter. This chart must be held upside down if binoculars, opera glasses, or an erecting type telescope is used.

Because of Jupiter's nearness to the Sun, the charts of satellites are omitted for the period August 24th to October 20th.

XUM

ASTRONOMICAL CALENDAR

Eastern Standard Time

NOVEMBER, 1957

Nov.	1— 4:— am	Venus greatest heliocentric latitude south
	2— 5:11 am	Minimum of Algol
	4— 2:— am	Quadrature, Uranus and Sun
	5— 2:— am	Minimum of Algol
	7—	Total eclipse of the Moon
	7—10:49 pm	Minimum of Algol
	8—10:— pm	Mercury in aphelion
	10— 7:38 pm	Minimum of Algol
	13— 4:27 pm	Minimum of Algol
	13— 8:— pm	Conjunction, Mars and Neptune; Mars south 1° 15'
	14— 1:45 am	Conjunction, Uranus and Moon; Uranus north 6° 9'
	16— 1:16 pm	Minimum of Algol
	17— 7:— am	Uranus stationary in Right Ascension
	18— 2:— am	Venus greatest elongation east, 47° 14'
	18— 9:57 pm	Conjunction, Jupiter and Moon; Jupiter north 2° 59'
	19—10:05 am	Minimum of Algol
	19— 5:05 pm	Conjunction, Neptune and Moon; Neptune north 2° 27'
	19—11:22 pm	Conjunction, Mars and Moon; Mars north 0° 46'
	21— 4:— pm	Conjunction, Mercury and Saturn; Mercury south 3° 34'
	22— 6:53 am	Minimum of Algol
	22— 2:16 pm	Conjunction, Saturn and Moon; Saturn south 1° 36'
	22— 4:51 pm	Conjunction, Mercury and Moon; Mercury south 5° 19'
	25— 3:42 am	Minimum of Algol
	25— 8:35 am	Conjunction, Venus and Moon; Venus south 8° 11'
	28—12:31 am	Minimum of Algol
	29— 6:— am	Mercury greatest heliocentric latitude south
	30— 9:20 pm	Minimum of Algol

AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

DECEMBER, 1957

THE SUN: reaches its deepest point in the southern hemisphere, as it moves from Scorpio into Sagittarius. The *solstice* occurs on the 21st. Distance decreases from 91.6 to 91.3 million miles.

THE MOON: perigee occurs on the 14th at 230,000 miles distance, and apogee takes place on the 27th at 251,000 miles.

Libration: Maximum exposure of the region on the Moon's limbs takes place as follows:

December 7 East limb, 5.0°
December 11 North limb, 6.7°
December 22 West limb, 4.8°
December 24 South limb, 6.7°

The Moon's phases (E.S.T.):

Full Moon	December 7 at 1:16 am
Last Quarter	14 at 12:45 am
New Moon	21 at 1:12 am
First Quarter	28 at 11:52 pm

MERCURY: retrogrades most of the month in the Ophiuchus-Sagittarius area, achieving greatest elongation east of the Sun, 20° 58', on the 7th. For the first week or two of the month, Mercury will be observable in the early evening sky, low in the west in the twilight zone, shining as a bright star. Magnitude will be about -0.2, and a small telescope is all that is necessary to show the planet like the half moon. It is in inferior conjunction with the Sun on the 25th, entering the morning sky at this time. It is closest to the earth the 26th at 63 million miles.

VENUS: continues as the ruler—in fact, the one and only planet, of the night sky. On the 23rd it achieves greatest brilliancy—magnitude -4.4—and shines with a brightness unequalled by any other celestial object except the Sun and the Moon. If you know where to look, this planet can be seen easily in broad daylight—the Barritt-Serviss Star & Planet Finder is a great help. Venus moves from Sagittarius well into Capricornus. Distance decreases from 53 million miles the 1st, to 34 million miles the 31st—angular diameter increases from 29" to 46". From a phase standpoint, illumination decreases from 44% to 20%.

MARS: moves from Libra into Scorpio in the morning sky. It rises just ahead of the Sun, and is, therefor, too close to the Sun for satisfactory observation. Distance decreases from 227 to 212 million miles.

JUPITER: holds forth in Virgo, close to the bright star, Spica. It can be seen in the late morning sky, shortly before sunrise. Though not well placed for observation, it is still one of the most interesting of celestial phenomena. Good binoculars will show the four bright satellites (see charts elsewhere in this issue); a small telescope will show the bands across the disc of Jupiter. On the 15th, distance is 551 million miles.

SATURN: in Ophiuchus, is too close to the Sun all month to be observable. It is in the evening sky until conjunction with the Sun on the 8th. Distance the 9th is 1016 million miles—greatest distance this year.

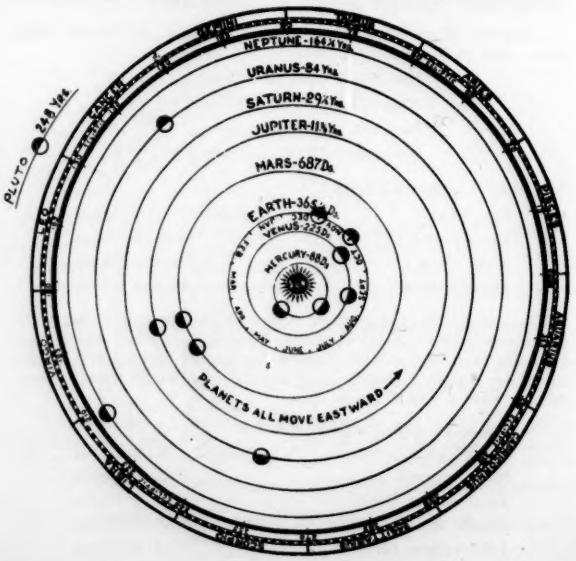
URANUS: is in the morning sky, rapidly becoming better situated for observation. In Cancer all month, magnitude is 6, so that visibility is restricted to optical aid—although, on a very clear, dark night, this planet can just be seen with the naked eye. Distance the 15th is 1656 million miles.

NEPTUNE: is in the morning sky in Virgo, not far from Jupiter. This planet, however, shines at magnitude 8, and is therefor, not visible to the naked eye. At best, this is a dull and uninteresting planet, but a disc can be discerned under a power of 100 diameters and up. See the Jan.-March, 1957 "Map" for a complete chart of the location of Neptune. Distance the 15th is 2877 million miles.

MORNING SKY MAP FOR NOVEMBER

AT 5:30 A.M., NOV. 1; 4:30 A.M., NOV. 15; 3:30 A.M., NOV: 30

HELIOCENTRIC POSITIONS OF THE PLANETS, NOVEMBER



ASTRONOMICAL CALENDAR

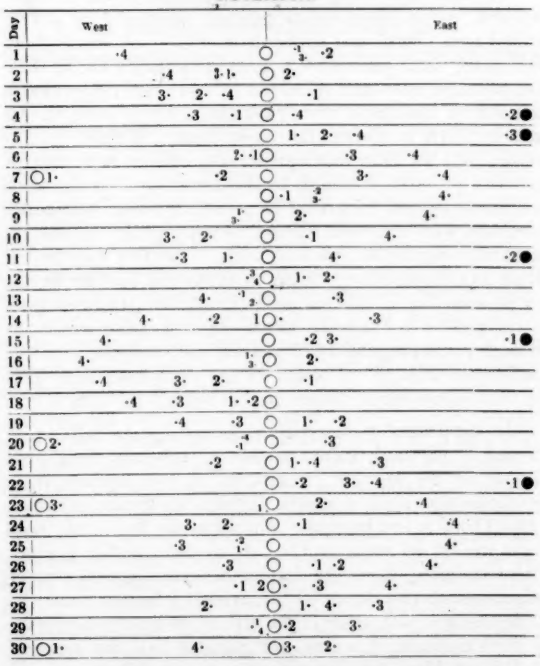
Eastern Standard Time

DECEMBER, 1957

Dec.	3— 6:10 pm	Minimum of Algol
	6— 2:59 pm	Minimum of Algol
	7— 7:— pm	Mercury greatest elongation east, 20° 58'
	8—10:— pm	Conjunction, Saturn and Sun
	9—11:48 am	Minimum of Algol
	11— 6:44 am	Conjunction, Uranus and Moon; Uranus north 6° 3'
	12— 8:37 am	Minimum of Algol
	15— 5:26 am	Minimum of Algol
	16— 3:— am	Mercury stationary in Right Ascension
	16—12:57 pm	Conjunction, Jupiter and Moon; Jupiter north 2° 29'
	17— 1:57 am	Conjunction, Neptune and Moon; Neptune north 2° 18'
	18— 2:15 am	Minimum of Algol
	18— 7:— am	Mercury in ascending node
	18— 3:56 pm	Conjunction, Mars and Moon; Mars south 1°-20'
	20— 5:09 am	Conjunction, Saturn and Moon; Saturn south 1° 51'
	20—11:04 pm	Minimum of Algol
	21— 6:52 pm	Conjunction, Mercury and Moon; Mercury south 3° 16'
	21— 9:49 pm	Sun enters Capricornus; *solstice*
	22—10:— pm	Mercury in perihelion
	23— 7:53 pm	Minimum of Algol
	23—11:— pm	Venus at greatest brilliancy
	24— 1:27 pm	Conjunction, Venus and Moon; Venus south 5° 48'
	25— 3:— pm	Inferior conjunction, Mercury and Sun; Mercury north 2° 19'
	26— 4:42 pm	Minimum of Algol
	27—11:— am	Venus in ascending node
	29— 1:32 pm	Minimum of Algol

SATELLITES OF JUPITER

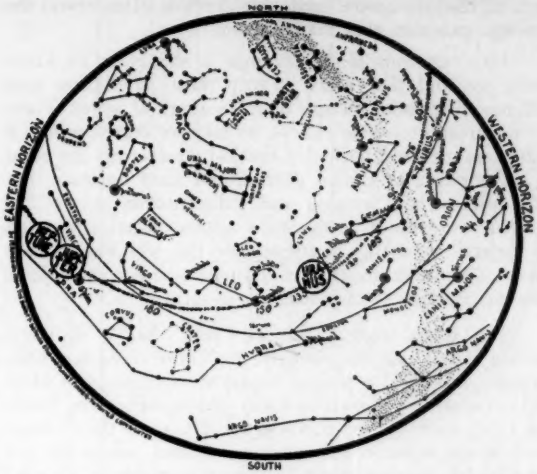
NOVEMBER



Appearance of Jupiter and its satellites at 6:45 A.M., E.S.T. as seen in an inverting telescope

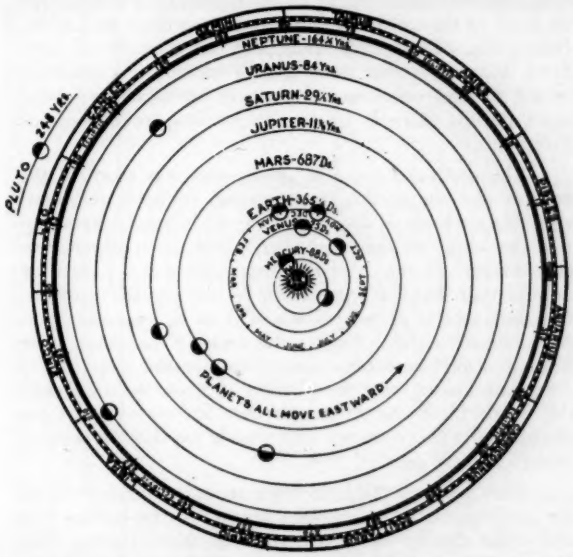
NOTICE: There is an opportunity to purchase an interest in The Monthly Evening Sky Map. Interested parties contact the Editor, Personal, The Monthly Evening Sky Map, Box 88, Rutherford, New Jersey.

MORNING SKY MAP FOR DECEMBER



AT 4:30 A.M., DEC. 1; 3:30 A.M., DEC. 15; 2:30 A.M., DEC. 31

HELIOCENTRIC POSITIONS OF THE PLANETS, DECEMBER



—*Continued from Page 3*

236 million miles. During October, Comet Mrkos follows a path through Libra, slanting southward and following a path pretty much parallel to the two top stars in the familiar square comprising Libra, and just a few degrees north of those stars. Magnitude is predicted to diminish from about 9.2 to 11 during October, but the writer's observations show this to be too faint. It will not be a naked-eye object, however.

The binoculars used by the writer, and referred to above, proved so amazing in performance and price, that the "MAP" hastened to secure same for our readers. You will find them advertised elsewhere in this issue.

Binoculars are an exceedingly useful tool for the amateur astronomer. They possess distinct advantages over field glasses and small telescopes. The optical construction of binoculars is similar to that of field or opera glasses, but instead of erecting the image through the use of a "negative" lens eyepiece—which precludes high powers, and

—*Continued on Page 9*

XUM

—*Continued from Page 2*

planet's surface may contain clues to their origin. The outlines of features on the earth, for example often reveal the geologic processes that shaped them.

First, on considering geologic processes as we know them, we find that Mars' history must have been very different from ours because of the scarcity of water. There are no streams to erode valleys, no lakes or oceans in which sediments can be deposited. Chemical weathering can occur in the presence of carbon dioxide and scant moisture, but what processes of erosion and sedimentation exist? The Martian winds must be the main agents for transportation of material, and this is attested by the well-known dust storms. One other major terrestrial geologic process appears possible, but let us save that for a surprise!

The south tropical belt of "seas" has a distinctly banded appearance. Surprisingly, this has received very little mention, though it is plainly displayed in all maps of Mars and is beautifully shown by many photographs. The bands run from south-east to north-west, so long as they remain south of the equator. But wherever a band crosses for any considerable distance into the northern hemisphere, it curves to the north and north-east, and finally ends in a pointed "bay". Such bays are characteristic of the northern "coasts" of the seas that are wholly south of the equator, but the only bays that hook around to the north-east are those that lie north of the equator. Prominent among these are Dawes' forked bay, Margaritifer Sinus, and the giant of all bays, Syrtis Major. Another noticeable orientation is a tendency of the stronger canals in the northern hemisphere to trend north-easterly (Lowell, 1908), though these are conspicuous exceptions.

The south-east trend of the banded seas south of the equator and the north-easterly courses of northern canals resemble a schematic diagram of the trade winds. Recalling that the winds are the most likely agent for transportation of sediment, we can infer that the banding is a pattern of sand or dust that has been drifted by the prevailing winds. Certainly such a pattern of winds is to be expected upon Mars, for air must rise above the areas of maximum solar heating, winds must blow inward to take the place of the rising air masses, and the planet's rotation should deflect the winds in the same manner that our trade winds are deviated. But this does not immediately explain the curving pattern and the pointed bays.

Mars' surface is all land; there are no oceans to stabilize the climatic belts. The strongest heating of the surface will will occur rapidly, as it does on terrestrial continents. The shift north and south with the direct solar rays, and heating wind patterns must shift north and south with the direct solar rays. This means that winds of monsoon type will be produced; they will cross the equator from north to south during the southern summer, and from south to north during the northern summer. As they cross the equator, the rotation of the planet will cause them to curve, just as the south-west monsoon winds of India are curved on crossing the equator. Looking at the Martian map we see vividly presented a flow pattern of dust of different colours carried by the winds. The banded pattern is strong south of the equator because the winds are strongest in the southern summer, when Mars is nearest the sun. The winds of the northern summer must be much weaker, what with less solar heating, and they cannot erase the pattern of dust deposited in the opposite season.

Now we see that the pointed bays have a very special significance. They must be the sources of the dark dust that is spread out downwind in long trails to form the banded pattern. In our terrestrial experience there is only one way in which a tiny point source can furnish so much dust. We therefore infer that the points of the bays are the sites of active volcanoes that erupt large amounts of ash into the atmosphere, to be carried by the winds and deposited in the fall-out pattern that we see (McLaughlin, 1954a-b). Long-distance transportation of volcanic dust is well established on the earth. Ash from Vesuvius has fallen in appreciable amounts hundreds of miles away (Phillips, 1869).

It has been known for many years that canals extend from pointed bays into the "deserts". The meaning of this now becomes clear. The canals are the weaker trails of ash deposited during the opposite season by the weaker reversed winds. Antoniadi even drew some of the canals in the form of fanned-out smudges, just the sort of feature we would expect if the winds carried the ash of the same volcanoes off over the light deserts.

The volcanic hypothesis also explains some striking changes (McLaughlin, 1955a-b) that formerly have been puzzling. The observations have been discussed by Antoniadi (1930, pp. 131, 141, 194). About 1800, a great horn-shaped dark marking, a twin to the Syrtis Major, crossed the equator to join Mare Cimmerium. Its curvature was consistent with the expected rotational deflection of the winds. It can be interpreted as an ash fall-out from a great eruption at the oasis, Pambotis Lacus. Since then, desert dust has covered it over. In the Solis Lacus region in 1877 a dark horn curved from Phoenicis Lacus towards the south, and it has since disappeared. In 1926 the Solis Lacus was distorted by a dark marking that fanned out from a small oasis, Ius Lacus. This marking, too, is no longer visible. These changes apparently represent great explosive eruptions followed by quiescence. The most remarkable feature is that in every case the curvature of the marking agreed with that of winds deflected by the planet's rotation.

Another type of evidence has recently come to light. In 1954, dense cloud knots formed repeatedly in a very limited area (Pettit and Richardson, 1955). A dense cloud close to the same position was photographed by O. H. Truman with the 100-inch telescope in 1941. In 1939, clouds occurred in the same area (Wright, 1939). And as far back as 1926 a spectacular cloud knot (Wright, 1927) formed in a location that agreed very closely with that of the cloud of 1954. If clouds form recurrently over the same area of the planet, they must be caused by some mechanism associated with a surface feature. One possibility is condensation of steam from volcanic vents. That this may be the nature of the recurring clouds is suggested further by the precise area that is afflicted with clouds: the strongest knot was very close to Phoenicis Lacus, the oasis from which the temporary marking of 1877 fanned out, and parts of the clouds were close to the source of the 1926 markings! This area will surely repay future careful study.

In the forms of the dark areas are due to fall-out of ash and if the dark colour is that of the ash, then what becomes of the Martian "vegetation"? It it farthest from my intention to deny categorically that vegetation exists on Mars. There is no observed phenomenon that fully convinces me of its presence, but its absence is not proven. When we recall how the Italian vineyard growers plant their vines on the slopes of Vesuvius, to benefit from the fertile volcanic soil, even at the risk of being wiped out by the next eruption, it seems just possible that the areas of ash fall on Mars may be the only places able to support even primitive plants. The seasonal changes may or may not be due in part to vegetation, but if they are, perhaps the forms of the areas where it can grow are determined by the fall-out pattern of the ash and the precious moisture that accompanies it.

—JOURNAL OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA, No. 422.

SATELLITES OF JUPITER

DECEMBER

Day	West					East				
1			4·		3·	2·	○	·1		
2		4·		·3		·2	1· ○			
3	4·				·3		○		·1	·2
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5			·4		2·		○	1·		·3
6				·4		·1	○		3·	·2●
7						·4	○	1·	2·	
8					3·	2·	○		·4	·1●
9				3·		·2	1· ○			·4
10					·3		○	·1	·2	·4
11						1·	○	2·		·4 ·3●
12					2·		○	1·	·3	4·
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32					·3	1·	○	4·	2·	

Appearance of Jupiter and its satellites at 6:30 A.M., E.S.T. as seen in an inverting telescope

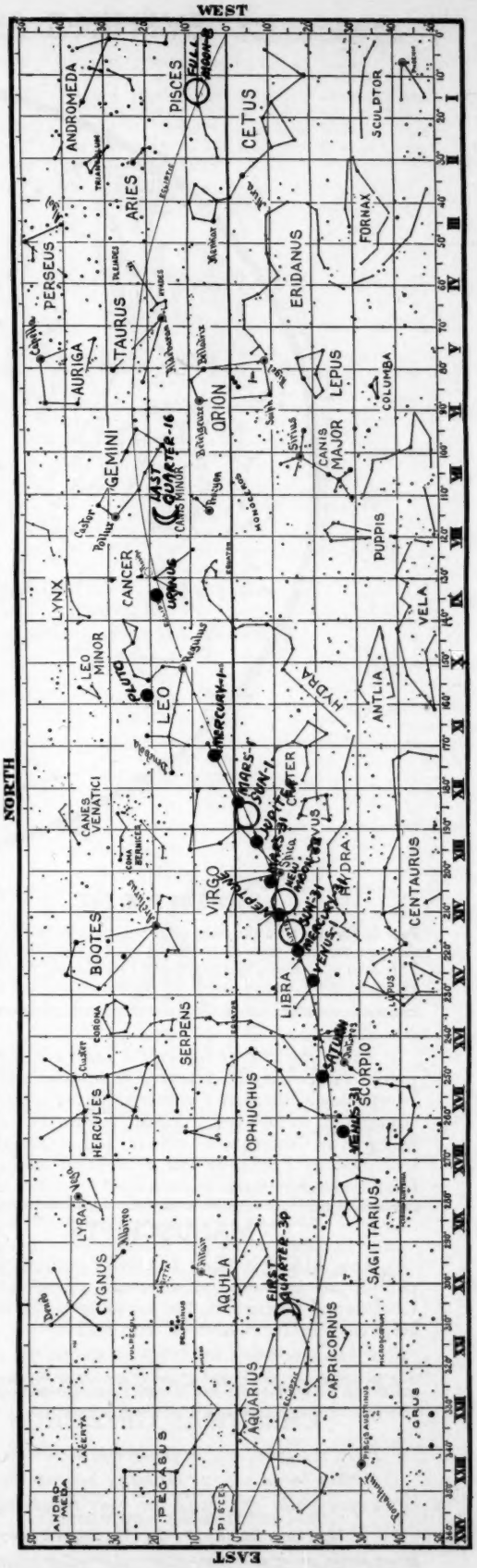
—*Continued from Page 7*

narrows the field of view—prisms have been added, which bend the light beam, erecting the image, and shortening the entire instrument. Thus the distance between the objective (front lens) and the eyepiece has actually been lengthened, and magnification of anywhere from 6 to 20 power can be obtained without making the glass bulky. The binoculars mentioned above—7 x 50—are ideal for astronomical tive lens of fifty millimeters diameter (two inches), allowuse. They provide seven times magnification and an objecing the maximum amount of light to reach the human eye, in addition to a wide field of view. The exit pupil of this glass is about 7.1 mm—the diameter of the brightly illuminated circle seen in the eyepiece when the glass is held away from the eye. In normal daylight conditions the average person's eye can accommodate an exit pupil of 3 to 4 mm; at night, rising to about 7 mm. Thus, these binoculars at night will make an obpect appear as bright as can be done, at the same time giving a wide (7.1°) field of view. To realize what a wide field of view means, try focussing a telescope at fifty power on a star—the narrow, one-half degree field makes the job trying, unless a low power finder 'scope is attached to the main tube. A modern improvement eliminates one of the drawbacks inherent in binoculars—light loss. It is a well-known phenomenon that under normal conditions, a loss of over 5% of light occurs an passing through an air-to-glass surface. Binoculars, containing many air-to-glass surfaces must, therefor, fail to transmit to the eyes a considerable portion of the light it receives. Coating of the lens surfaces eliminates most of this loss and restores the light to the transmitted beam. The image, consequently, becomes brighter and virtually eliminates the reflection of stray light among the surfaces, thereby improving contrast and definition.

—*Continued on Page 10*

A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view. Practical as a Star, Constellation and Planet Finder for the current month—October, 1957—Anywhere in the world.
Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases.



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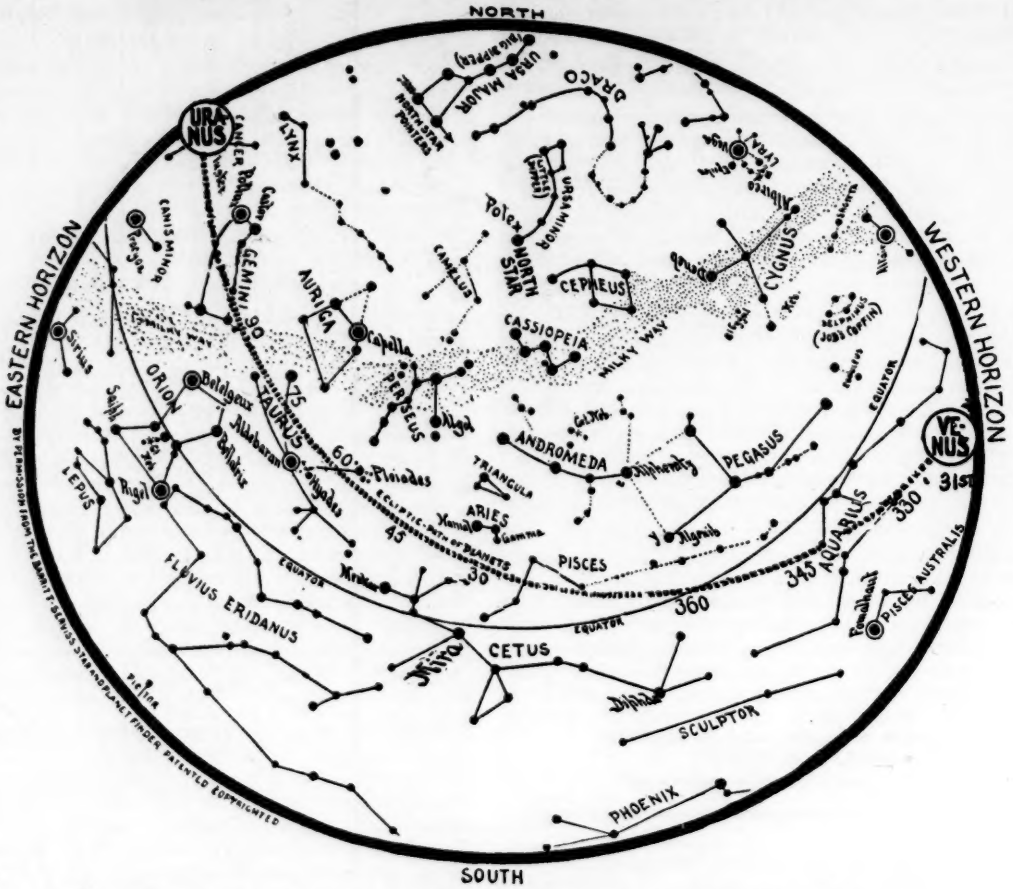
EVENING SKY MAP FOR DECEMBER



AT 9:00 P.M. DEC., 1 **8:00 P.M., DEC. 15** **7:00 P.M., DEC: 31**

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper. This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitudes in Europe.

—Continued from Page 9

Using the 7 x 50 binoculars for sweeping the skies proved exhilarating. Pick a very clear, moonless night, and sweep slowly through Cassiopeia, into Perseus; move to Andromeda to the Great Nebula; follow the course of the Milky Way. Nebula after nebula, and cluster after cluster will show up brilliantly, not to mention myriads of stars forever invisible to the unaided eye.

MANUSCRIPTS

The "MAP" is happy to receive manuscripts and will publish any and all considered as conforming with the fundamental purpose of this publication. We feel that, in keeping with the wishes of our readers, we cannot use material of too highly theoretical or technical a nature.

CHRISTMAS GREETINGS

May we take this opportunity to express our wishes for a joyous Holiday Season—and to express our gratitude for your loyal support.

Mrs. Leon Barritt **Irving L. Meyer**

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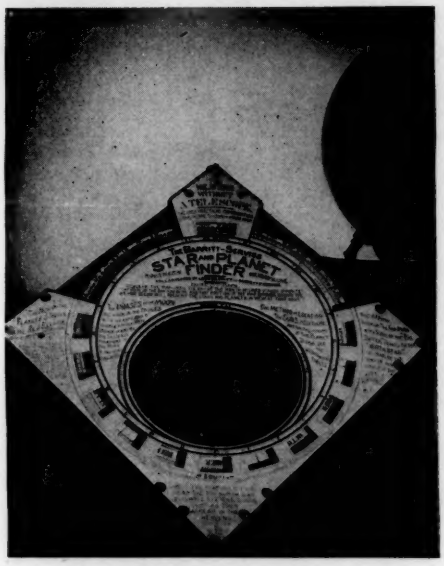

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	Individual eye focusing	**$22.95**
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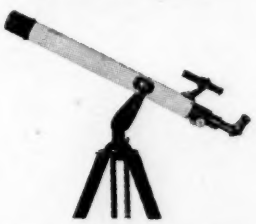
	Central focusing	**37.75**
15 x 65	**Fifteen power, 65mm objectives**	
	Central focusing	**$66.00**

TELESCOPES



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A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR

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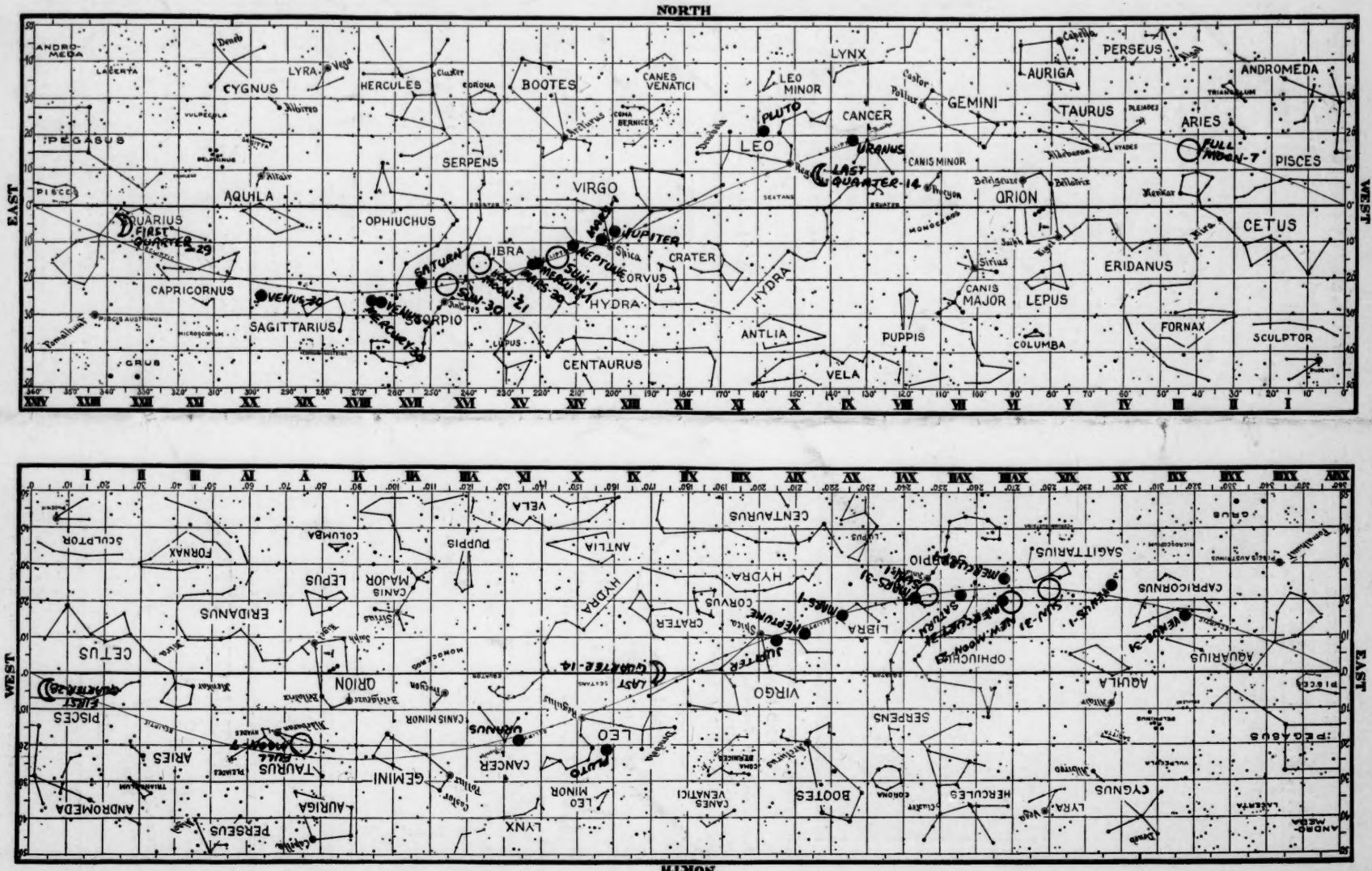
Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases.



Nov. 5 Oct. 22 Oct. 5 Sept. 20 Sept. 5 Aug. 20 Aug. 5 July 20 July 5 June 20 June 5 May 20 May 5 Apr. 20 Apr. 5 Mar. 20 Mar. 5 Feb. 18 Feb. 2 Jan. 20 Jan. 5 Dec. 20 Dec. 5 Nov. 20

THE DATE BELOW EACH NUMERAL WILL SHOW WHEN THAT SECTION OF THE MAP WILL BE ON THE MERIDAN—DUE SOUTH—AT 9 P.M. OR AN HOUR EARLIER FOR EACH NUMERAL WEST OF THIS DATE AND AN HOUR LATER FOR EACH NUMERAL EAST.

XUM

XUM

Nov. 5 Oct. 22 Oct. 5 Sept. 20 Sept. 5 Aug. 20 Aug. 5 July 20 July 5 June 20 June 5 May 20 May 5 Apr. 20 Apr. 5 Mar. 20 Mar. 5 Feb. 18 Feb. 2 Jan. 20 Jan. 5 Dec. 20 Dec. 5 Nov. 20

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